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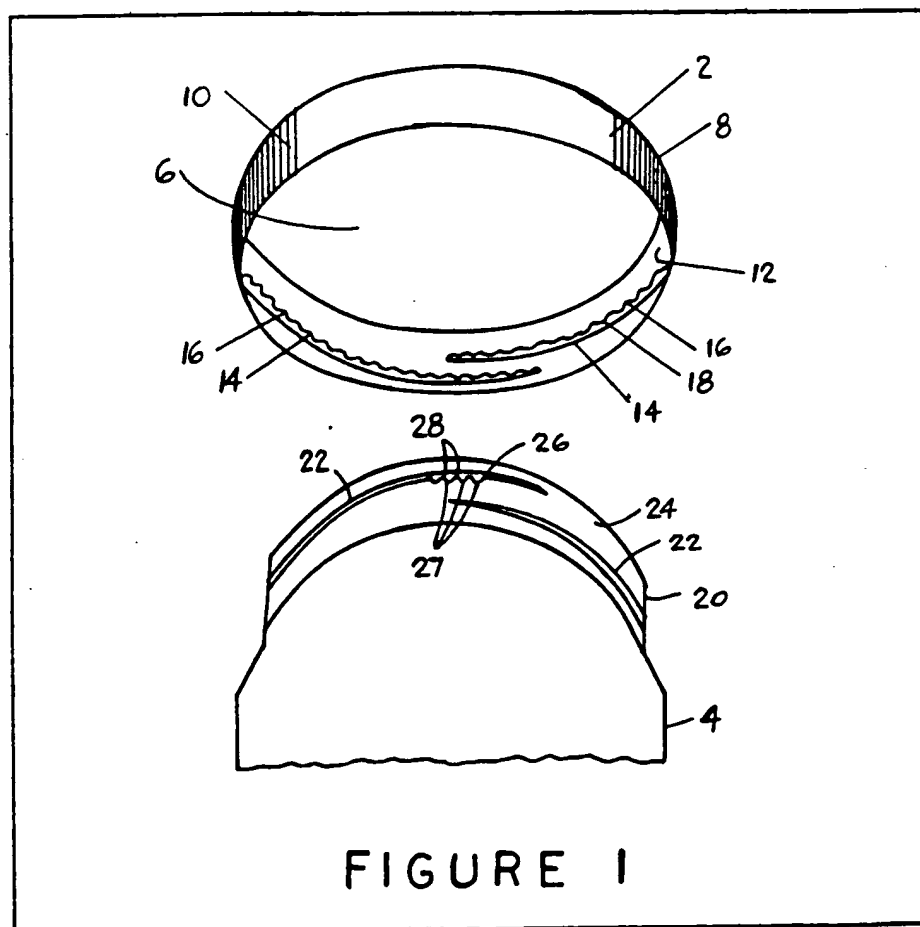
# (12) UK Patent Application (19) GB (11) 2 035 972 A

- (21) Application No 7937505
- (22) Date of filing 30 Oct 1979
- (30) Priority data
- (31) 78/42697
- (32) 31 Oct 1978
- (33) United Kingdom (GB)
- (43) Application published 25 Jun 1980
- (51) INT CL<sup>3</sup>  
B65D 55/12
- (52) Domestic classification  
B8T HT
- (56) Documents cited  
GB 2006725A  
GB 1457522  
GB 1249285  
US 4053077A  
US 3790014A
- (58) Field of search  
B8T
- (71) Applicants  
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## (54) Closure cap and container

(57) Closure caps screwed onto containers are known to back-off or unscrew when subjected to vibration and general movement during transit and handling. To alleviate this problem, the screw threads 14,22 of a

cap 2 and container 4, respectively, each have sufficient alternate ridges 16,27 and indentations 18,28 over at least part of their length so that when the cap 2 and container 4 are in a closed position at least one ridge on one screw thread can engage an indentation on the other screw thread.



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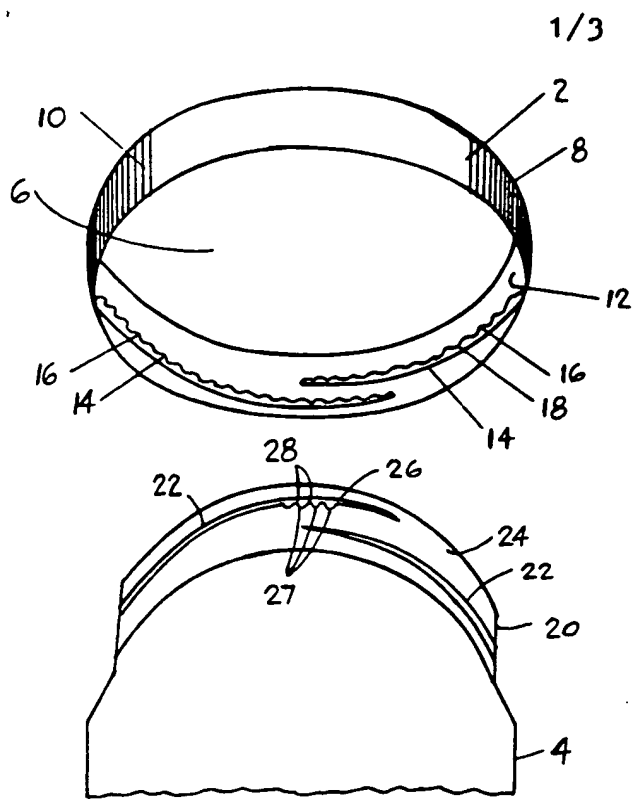


FIGURE 1

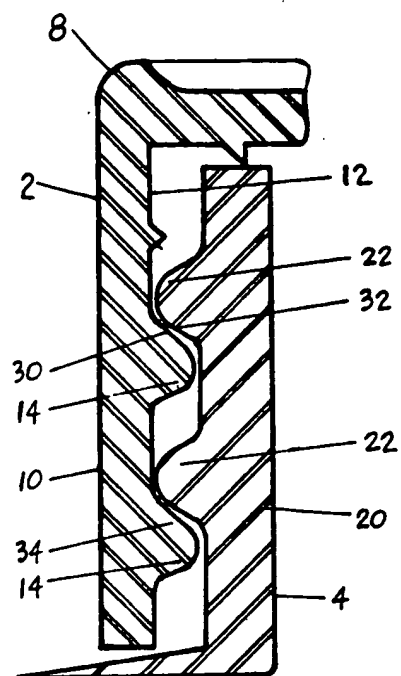


FIGURE 2

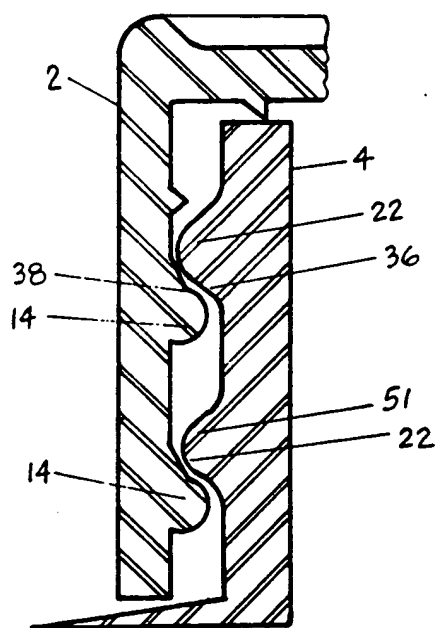
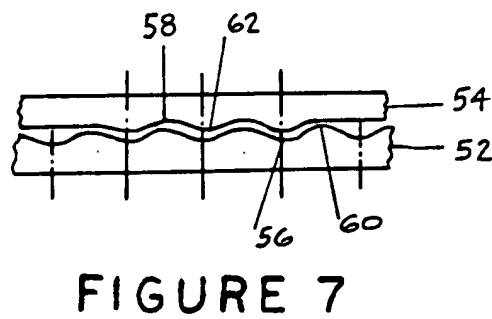
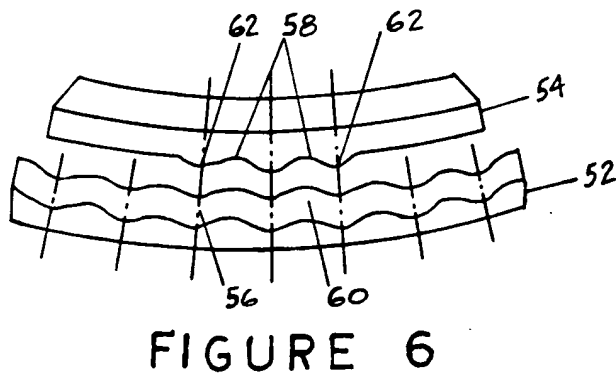
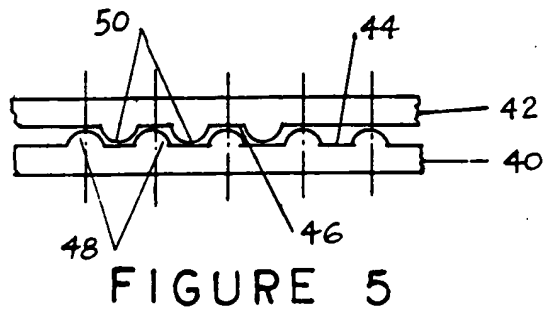
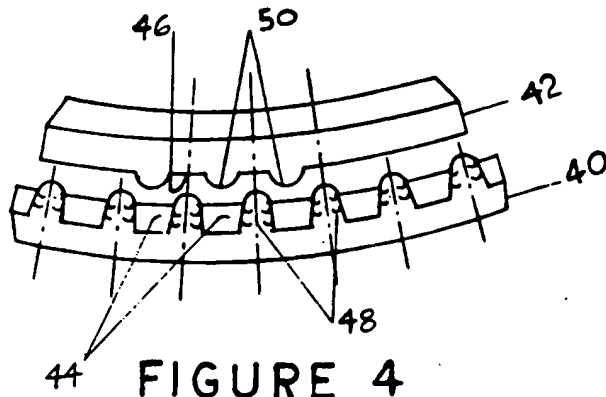


FIGURE 3



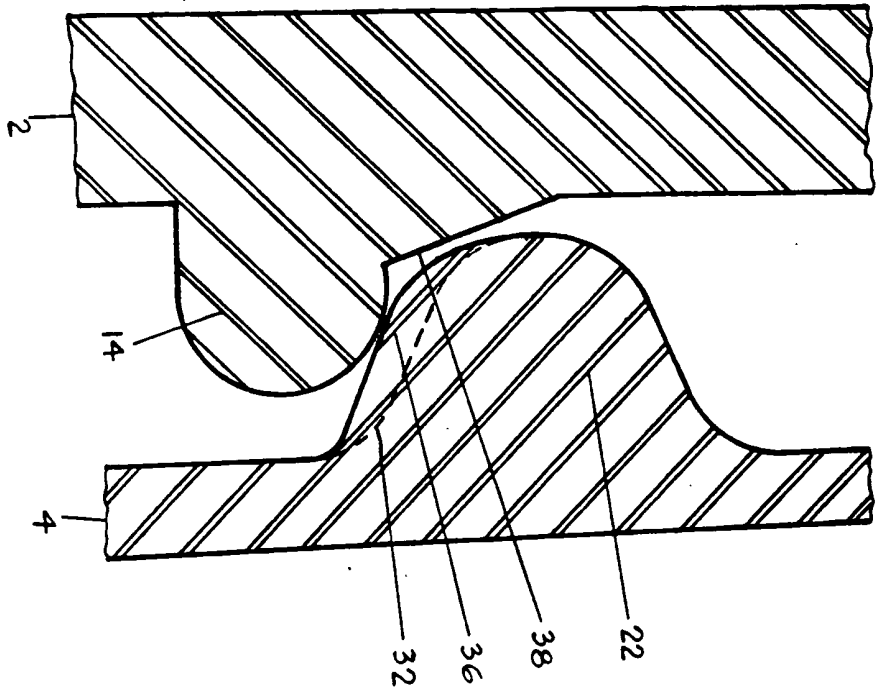


FIGURE 8

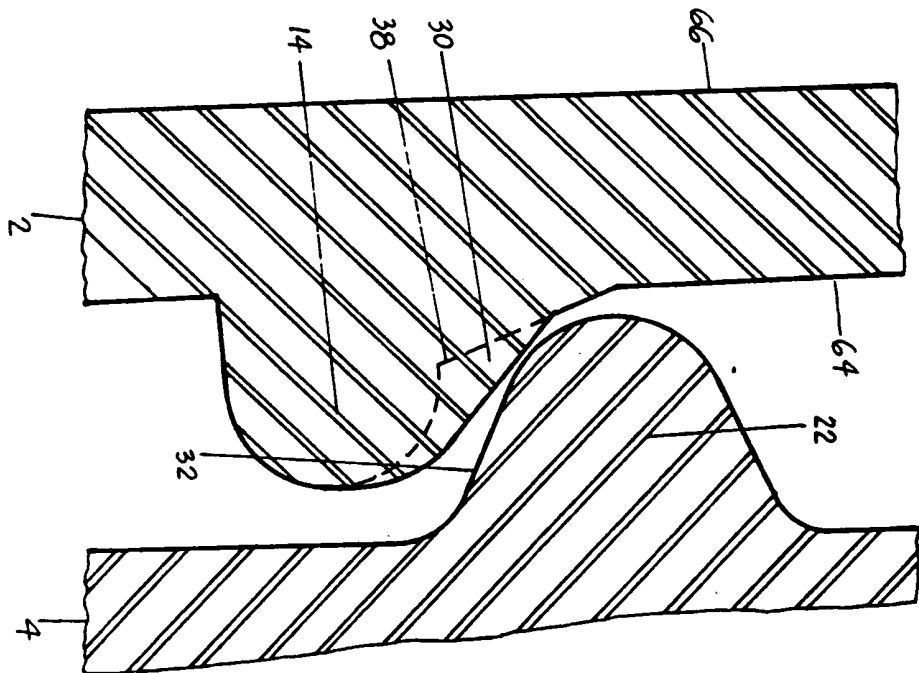


FIGURE 9

**SPECIFICATION**  
**Closure cap and container**

This invention relates to a closure cap, a container and to a closure cap and corresponding container in combination.

It is known to have closure caps and corresponding containers having continuous or intermittent screw threads to engage each other when the cap and the container are in a closed position. However, after the container has been filled with product and the cap has been affixed, the containers are shipped to various wholesale and retail outlets and are subjected to vibration during transit and handling. This vibration and general movement sometimes causes the cap to back-off from the container, thereby subjecting the product to the risk of contamination, or the inner parts of the container become soiled and the product becomes unsaleable.

This invention relates to a closure cap for use in combination with a corresponding container having a neck surrounding an opening with said neck having a screw thread on its outer surface. The cap has a central portion and a periphery with a flange extending from the periphery for contacting the container, said flange having a screw thread on its inner surface. The screw threads each have sufficient alternate ridges and indentations over at least part of their length so that when the cap and container are in a closed position at least one ridge on one screw thread can engage an indentation on the other screw thread.

This invention further relates to a closure cap and corresponding container in combination wherein said cap has a central portion and a periphery, with a flange extending from the periphery for contacting the container, said flange having a screw thread on its inner surface. The container having a neck surrounding an opening, with a screw thread on the outer surface of said neck. The screw threads of the cap and container each having sufficient alternate ridges and indentations over at least part of their length so that when the cap and container are in a closed position at least one ridge of one screw thread can engage an indentation of the other screw thread.

This invention further relates to a container for use in combination with a corresponding cap having a central portion and a periphery with a flange extending from the periphery for contacting said container said flange having a screw thread on its inner surface, said container comprising a neck surrounding an opening, with said neck having a screw thread on its outer surface, said screw threads each having sufficient alternate ridges and indentations over at least part of their length, so that when the cap and container are in a closed position, at least one ridge on one screw thread can engage an indentation on the other screw thread.

Preferably, the closure cap is made of plastic and the container is made of glass or injected or blow-molded plastic. Polypropylene is an example

of a type of plastic that can be used. Other suitable materials for the cap or container will become readily apparent to those skilled in the art. The screw threads of the cap and container of the present invention may be continuous or intermittent so long as the ridges and indentations are located over a sufficient portion of the length of the screw thread so that at least one ridge on one screw thread can engage an indentation on the other screw thread when the cap and container are in a closed position. It is possible to have an intermittent screw thread on the cap and a continuous screw thread on the container or vice-versa or a suitable combination thereof. It is possible to have only one ridge on one screw thread and only one indentation on the other screw thread so long as the one ridge can engage the one indentation when the cap and container are in a closed position.

In the accompanying drawings, which illustrate an embodiment of the invention:

Figure 1 is a partial perspective view of a cap and container of the present invention in an open position with the cap located above the container;

Figure 2 is a partial cross-sectional view of the cap and the container in a closed position with a ridge of the cap engaged in an indentation of the container;

Figure 3 is a partial cross-sectional view of the cap and the container in a closed position with a ridge of the container engaged in an indentation of the cap;

Figure 4 is a partial perspective view of ridges and indentations in the screw threads of both the cap and container;

Figure 5 is a side view of the ridges and indentations of Figure 4;

Figure 6 is a partial perspective view of a variation in the type of indentation and ridge;

Figure 7 is a side view of the ridges and indentations of Figure 6;

Figure 8 is a magnified schematic partial sectional view of a ridge of the container engaged in an indentation of the cap;

Figure 9 is a magnified schematic partial sectional view of a ridge of the cap engaged in an indentation of the container.

Referring to the drawings in greater detail, in Figure 1, a closure cap 2 is located immediately above a corresponding container 4. The closure cap 2 has a central portion 6 and a periphery 8 with a flange 10 extending from the periphery. On the inner surface 12 of the flange 10, there is located a continuous screw thread 14 (only part of which is shown). The screw thread 14 has a series of alternate ridges 16 and indentations 18 located over its length. The series of ridges 16 and indentations 18 could be intermittent rather than continuous over the screw thread or there could be one series located over only a part of the screw thread.

The container 4 has a neck 20 with a continuous screw thread 22 located on an outer surface 24 of the neck 20. The screw thread 22 corresponds to the screw thread 14 but contains

two groups 26 (only one of which is shown), of ridges and indentations each having three ridges 27 and two adjacent indentations 28. the two groups 26 are located on the screw thread 22 approximately 180 degrees apart from one another. The ridges 16 and indentations 18 are located on the upper portion of the screw thread 14 and the ridges 27 and indentations 28 being located on the lower portion of the screw thread 22. When the cap 2 is placed over the neck 20 of the container 4 and the cap 2 is rotated to a closed position relative to the container 4, the indentations 18 of the cap 2 are engaged by the ridges 27 of the container 4 and the ridges 16 of the cap 2 can engage the indentations 28 of the container 4.

The ridges 16 and the cap 2 have a width approximately equal to the width of the indentations 18. Similarly, the ridges 27 of the container 4 have a width approximately equal to the width of the indentations 28. Also, the ridges 16 and indentations 18 of the cap 2 have a width approximately equal to that of the ridges 27 and indentations 28 of the container 4. Preferably, the screw thread of the cap has a continuous series of indentations and ridges over its length while the screw thread of the container has only two groups of indentations and ridges, each having three ridges and two adjacent indentations. The two groups are preferably spaced approximately 180 degrees apart from one another. The series of indentations and ridges on the screw thread of the cap could be intermittent or continuous. The series of indentations and ridges on the screw thread of the container could likewise be intermittent or continuous. So long as there are a sufficient number of alternate indentations and ridges on each of the screw threads of the cap and container so that, when the cap is in a closed position, at least one ridge on one screw thread can engage an indentation on the other screw thread, any combination of intermittent or continuous series of ridges and indentations can be used. Also, the screw threads themselves could be intermittent or continuous.

Thus, once the cap 2 and the container 4 are in a closed position, the cap 2 will not back off or move any appreciable peripheral distance relative to the container 4 when the cap and container are vibrated during transit and handling.

In Figure 2, the cap 2 is shown in a closed position on the container 4 with a ridge 30 of the screw thread 14 engaged in an indentation 32 of the screw thread 22. A ridge 34 on the lower part of the screw thread 14 rests against the screw thread 22. There are no ridges or indentations on the screw thread 22 near the ridge 34 as there are only two groups of indentations and ridges on the screw thread 22 as described above for Figure 1.

In Figure 3, the cap is shown in a closed position on the container 4 with a ridge 36 on the screw thread 22 of the container 4 engaged in an indentation 38 on the screw thread 14 of the cap 2. In both Figures 2 and 3, the ridges and indentations are shown out of actual contact for

use of illustration.

It is possible when the cap is closed on the container 4 that the ridges on the screw thread of the cap will engage the ridges on the screw thread of the container. In addition, the indentations on the cap and container will be located immediately opposite to one another. While this position is not desirable, it will occur, particularly when the cap is tightened onto the container by machine. When this occurs, the cap may back-off slightly relative to the container as the result of vibrations during transit or otherwise to the point where the ridges 16 of the cap 2 engage the indentations 28 of the container 4 and vice-versa. As the ridges are immediately adjacent to the indentations on each of the screw threads 14, 22, the cap 2 will move only half the distance between consecutive ridges 16 of the screw thread 14 before the ridges 16 are properly engaged with the indentations 28. Generally, the backing off movement will be so miniscule that a safe seal will still be maintained and no contamination or spoiling of the product located within the container will result. The degree of tightness of the cap on the container can be controlled and regulated by the amount of torque applied by the capping machine.

Of course, sometimes the cap will engage the container in a closed position where the ridges of the cap and container engage one another but are not directly opposite. This will also result in a slight backing-off of the cap relative to the container to the point where the ridges engage the immediately adjacent indentations. Again, this slight backing-off should not result in any contamination or spoiling of any product located within the container.

In Figures 4 and 5, there are shown screw threads 40, 42 of a cap and container respectively (not shown). Indentations 44, 46 and ridges 48, 50 of the cap and container respectively all have approximately equal widths. In Figure 4, the screw threads 40, 42 are in an open position. In Figure 5, they are in a closed position with some of the indentations 44 on the screw thread 40 of the cap engaged by the ridges 50 on the screw thread 42 of the container and the indentations 46 on the screw thread 42 of the container are engaged by the ridges 48 on the screw thread 40 of the cap.

The indentations 44, 46, as shown in Figures 4 and 5, are created by the formation of the ridges 48, 50. In other words, the indentations 44, 46 are created by "adding" the ridges 48, 50 to the screw threads 40, 42 rather than by "cutting" into the screw threads 40, 42. There is no "addition" or "cutting" made to the screw threads 40, 42 to create the indentations 44, 46. The cross-section of the screw threads 40, 42 through the indentations 44, 46 are the same as the cross-sections of these screw threads before the ridges 48, 50 are "added". Of course, the ridges could be created in a similar manner by cutting indentations into appropriate screw threads. Or, the ridges and indentations could be created partially by cutting into appropriate screw thread and partially by adding on to appropriate screw

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threads. The manner of creating the indentations and ridges will be readily apparent to those skilled in the art.

Returning to Figures 2 and 3, the cross-section of the screw thread 22 as shown in Figure 2 is the same as that of a standard screw thread without ridges or indentations. Similarly, the cross-section of the screw thread 14 as shown in Figure 3 is the same as that of a standard screw thread without ridges or indentations. In Figure 3, the cross-section of a lower portion 51 of the screw thread 22 is the same as that of a standard screw thread as there is no ridge at this point on the screw thread 22.

In Figures 6 and 7, there are shown screw threads 52, 54 of a cap and container respectively. The Figures show a variation in the shape of indentations 56, 57 and ridges 60, 62 on the screw threads 52, 54 of the cap and container respectively. The ridges and indentations of the cap and container are mirror images of one another and are shown slightly apart in Figure 7 for ease of illustration.

Referring to Figure 8 in greater detail, a ridge 36 on a screw thread 22 of a container 4 is shown engaged in an indentation 38 of a screw thread 14 of a cap 2. There is also shown, by means of a dotted line, the cross-sectional shape of an indentation 32 immediately behind and adjacent to the ridge 36. The cross-section of the screw thread 14 as shown in Figure 8 is the same as that of a standard screw thread for a plastic cap.

Referring to Figure 9 in greater detail, there is shown a ridge 30 on a screw thread 14 of a cap 2 engaged in an indentation 32 on a screw thread 22 of a container 4. There is also shown by means of a dotted line, an indentation 38 immediately behind and adjacent to the ridge 30 on the screw thread 14. The cross-section of the screw thread 22 is the standard cross-section for screw threads of plastic or glass containers.

The results of the present invention can be achieved with ridges and indentations of various sizes and shapes. It was found that satisfactory results would be obtained for container diameters ranging from 18 millimetres to 132 millimetres by having ridges on the cap and containers with a depth of 0.3 millimetres, at their centre, the ridges being arcuate in cross-section and the distance between adjacent ridges being 2.5 millimetres. The depth of the ridge 30 on the screw thread 14 of the cap 2 as shown in Figure 9 increases beyond 0.3 millimetres as it is tapered at an angle of 45 degrees relative to the inner surface 64 of the flange 66. This tapered portion allows the cap 2 to be stripped from a mold during manufacture without damaging the ridges or screw thread.

One advantage of the present invention is that a cap having a screw thread containing indentations and ridges can be used efficiently with a container having a normal screw thread without indentations and ridges and vice-versa. Thus, caps on containers made in accordance with this invention are interchangeable with caps on containers having normal screw threads without

indentations or ridges.

## CLAIMS

1. A closure cap for use in combination with a corresponding container having a neck surrounding an opening with said neck having a screw thread on its outer surface, said cap comprising a central portion and a periphery with a flange extending from the periphery for contacting the container, said flange having a screw thread on its inner surface, said screw threads each having sufficient alternate ridges and indentations over at least part of their length, so that when the cap and container are in a closed position, at least one ridge on one screw thread can engage an indentation on the other screw thread.

2. A closure cap as claimed in Claim 1 wherein the screw thread of the cap has a series of alternate ridges and indentations over its length.

3. A closure cap as claimed in Claim 1 wherein the ridges and indentations along the screw thread of the cap are intermittent.

4. A closure cap as claimed in Claims 1, 2 or 3 wherein the ridges have a width of approximately equal to the width of the indentations.

5. A closure cap as claimed in Claims 1, 2 or 3 wherein the screw thread of the cap has one ridge.

6. A closure cap as claimed in Claims 1, 2 or 3 wherein the screw thread of the cap has one indentation.

7. A closure cap and corresponding container in combination comprising a cap having a central portion and a periphery, with a flange extending from the periphery for contacting the container, said flange having a screw thread on its inner surface, and a container having a neck surrounding an opening, with a screw thread on the outer surface of said neck, the screw threads of the cap and container each having sufficient alternate ridges and indentations over at least part of their length so that when the cap and container are in a closed position at least one ridge of one screw thread can engage an indentation of the other screw thread.

8. A closure cap and corresponding container in combination as claimed in Claim 7 wherein both screw threads have a series of alternate ridges and indentations over their length and various ridges of one screw thread can engage various indentations of the other screw thread when the cap and container are in a closed position.

9. A closure cap and corresponding container in combination as claimed in Claim 8 wherein one screw thread has a series of ridges and indentations over its length and the ridges and indentations on the other screw thread are divided into two separate groups located approximately 180 degrees apart, each group having three ridges and two indentations.

10. A closure cap and corresponding container in combination as claimed in Claims 7, 8 or 9 wherein the ridges have a width approximately equal to the width of the indentations.

11. A closure cap and corresponding container



in combination as claimed in Claim 9 wherein said one screw thread is that of the cap and said other screw thread is that of the container.

- 5 12. A closure cap and corresponding container in combination as claimed in Claim 7 wherein the screw thread of the cap has a series of ridges and indentations over at least part of its length and the screw thread of the container has one ridge.

- 10 13. A container for use in combination with a corresponding cap having a central portion and a periphery with a flange extending from the periphery for contacting said container said flange

having a screw thread on its inner surface, said container comprising a neck surrounding an opening, with said neck having a screw thread on its outer surface, said screw threads each having sufficient alternate ridges and indentations over at least part of their length, so that when the cap and container are in a closed position, at least one ridge on one screw thread can engage an indentation on the other screw thread.

14. A closure cap or container substantially as hereinbefore described with reference to the accompanying drawings.